MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023

PEM0044 – ESSENTIAL MATHEMATICS

(All Sections/Groups)

13 JULY 2023
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This Question paper consists of **THREE (3) pages** excluding cover page with **4 Questions** only.
2. Answer all **FOUR (4)** questions
3. Only NON-PROGRAMMABLE calculators are allowed.

Question 1 (25 Marks)

a) Solve each of the following equation:

i. $\frac{x+3}{2}+\frac{4x-1}{3}=4$ **(6 marks)**

ii. $|3x-4|=2$ **(4 marks)**

iii. $3x^2+9x-12=0$; by using factorization **(4 marks)**

b) Simplify the expression and express the answer so that all exponents are positive. **(6 marks)**

$$(3x^{-2}y^3z)^{-2}(x^3yz^4)^2$$

c) Solve the following inequality.

$$1 \leq 2x+4 \leq -5$$ **(5 marks)**

Question 2 (25 Marks)

a) Find an equation of a straight line containing points $(1,6)$ and $(3,-4)$. Graph the line. **(6 marks)**

b) Find an equation of straight line that passes through point $(-8,10)$ and is parallel to the line $4y+2x-8=0$. **(6 marks)**

c) Graph the transformation of the following function by starting with basic function.

$$f(x)=(x-4)^2+3$$ **(6 marks)**

d) If 3rd and 8th terms for a geometric sequence are 16 and 512 respectively, find the first term and the common ratio. Hence, find the sum of the first 10 terms. **(7 marks)**

Continued...

Question 3 (25 Marks)

a) Let $P = \begin{bmatrix} 4 & -4 & 0 \\ 8 & -6 & -2 \\ -4 & 2 & 6 \end{bmatrix}, Q = \begin{bmatrix} 3 & 4 & 3 \\ 3 & 0 & -2 \\ -4 & 8 & -5 \end{bmatrix}$,

Find $2P + Q$ **(5 marks)**

b) Given $R = \begin{bmatrix} 3 & -1 \\ 5 & -1 \end{bmatrix}$, find

i. R^T **(2 marks)**

ii. R^{-1} **(4 marks)**

c) Given that

$$P = \begin{bmatrix} 4 & -4 & 0 \\ 8 & -6 & -2 \\ -4 & 2 & 6 \end{bmatrix}$$

Find matrix of:

i. minor (P) **(5 marks)**

ii. cofactor (P) **(2 marks)**

iii. adjoint (P) **(2 marks)**

iv. determinant, $|P|$ **(2 marks)**

v. inverse, P^{-1} **(3 marks)**

Question 4 (25 Marks)

a) Differentiate each of the following function:

i. $f(x) = 2x^{3/4} + 4x^2 - \frac{x}{6}$ **(3 marks)**

ii. $f(x) = (3x + 1)(2x^2 - 4)$ **(5 marks)**

iii. $f(x) = (3x^4 - 5x^2 + 4x)^3$ **(4 marks)**

b) Integrate $\int x^2(x^3 + 6)^4 dx$ **(6 marks)**

c) Evaluate $\int_{-3}^{2}(4x^3 - 5x^2 + 2x + 3)dx$ **(7 marks)**

End of Question.

Course: Essential Mathematics
Code: PEM0044

Summary of Formulas

Basic Rules of Differentiation

(i) $f'(c) = 0$
(ii) $f'(x) = nx^{n-1}$
(iii) $cf(x)$: $cf'(x)$
(iv) $f(x) \pm g(x)$: $f'(x) \pm g'(x)$
(v) Product rule, $f(x) = u.v$: $f'(x) = uv' + vu'$
(vi) Quotient rule, $f(x) = \frac{u}{v}$; $f'(x) = \frac{vu' - uv'}{v^2}$
(vii) Chain rule: $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$
(viii) General power rule: Derive $[f(x)]^n = n[f(x)]^{n-1} f'(x)$

Basic Rules of Integration

(i) $\int k\,dx = kx + C$
(ii) $\int x^n\,dx = \frac{x^{n+1}}{n+1} + C$
(iii) $\int kf(x)\,dx = k\int f(x)dx$
(iv) $\int (f \pm g)(x) = \int f(x)dx \pm \int g(x)dx$

End of Page.